



System Overview

Joe Guzek

System Design Review - 27 June 1994

Agenda



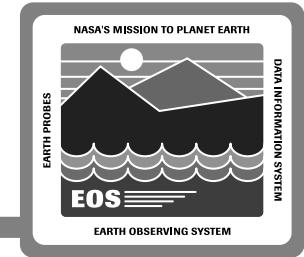
SDR Baseline

- **Missions Supported**
- **Product Set**
 - **Processing**
 - **Storage**
 - **Product Dependencies**
- **Requirements**

SDR Design Detail

System Overview

SDR Baseline

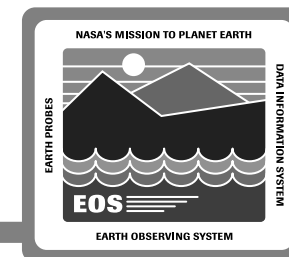


Missions Supported

- **EOS Spacecrafts**
 - Flight Ops/Processing/Archiving/Distribution for AM1, PM, ALT, CHEM
 - Archiving/Distribution for COLOR (SeaWIFS II)
- **TRMM**
 - Processing/Archiving/Distribution for CERES/LIS
 - Archiving/Distribution for remaining instruments (VIRS, PR, TMI, GV)
- **Landsat**
 - Baseline changing to ECS providing archive of L0R data (This is not currently in our system sizing model)
- **ADEOS II**
 - Processing/Archiving/Distribution for SeaWinds
- **Radarsat, JERS1, JERS2, ERS1, ERS2** - handled as part of V0 to V1 transition

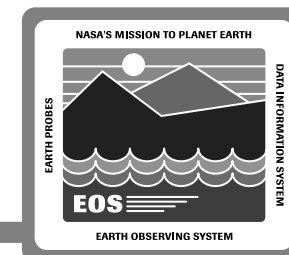
Product Set Baseline Summary (SPSO list dated 2/14/94 with MODIS and reviewed for application of processing efficiency factor)

Product Set Processing Requirements (At and Post Launch)



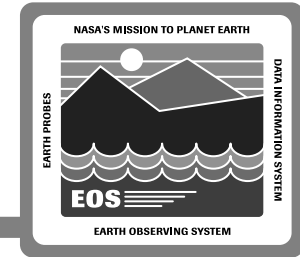
| Level | Platform | DAACs | | | | | | | | TOTAL (MFLOPS) |
|----------------------|----------|-------|--------|----------|-------|---------|-------|-------|------|-------------------|
| | | ASF | EDC | GSFC | JPL | LaRC | MSFC | NSIDC | ORNL | |
| Level 1 | TRMM | 0.00 | 0.00 | 0.00 | 0.00 | 1.88 | 0.88 | 0.00 | 0.00 | 2.76 |
| | A M - 1 | 0.00 | 22.00 | 2400.00 | 0.00 | 1468.91 | 0.00 | 0.00 | 0.00 | 3890.91 |
| | COLOR | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | AERO | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 | 0.00 | 0.00 | 0.00 | 0.21 |
| | ADEOS II | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 |
| | P M - 1 | 0.00 | 0.00 | 2440.24 | 0.00 | 3.75 | 0.85 | 0.00 | 0.00 | 2444.84 |
| | ALT | 0.00 | 0.00 | 23.15 | 1.50 | 0.00 | 0.00 | 0.00 | 0.00 | 24.65 |
| | CHEM | 0.00 | 0.00 | 15.33 | 0.00 | 0.22 | 0.00 | 0.00 | 0.00 | 15.55 |
| | Total | 0.00 | 22.00 | 4878.72 | 1.57 | 1474.97 | 1.73 | 0.00 | 0.00 | 6378.99 |
| Level 2 | TRMM | 0.00 | 0.00 | 0.00 | 0.00 | 238.31 | 0.10 | 0.00 | 0.00 | 238.41 |
| | A M - 1 | 0.00 | 132.05 | 774.00 | 0.00 | 1010.49 | 0.00 | 1.30 | 0.00 | 1917.84 |
| | COLOR | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | AERO | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 | 0.00 | 0.00 | 0.00 | 0.21 |
| | ADEOS II | 0.00 | 0.00 | 0.00 | 3.45 | 0.00 | 0.00 | 0.00 | 0.00 | 3.45 |
| | P M - 1 | 0.00 | 0.00 | 2394.10 | 0.00 | 476.63 | 9.60 | 2.10 | 0.00 | 2882.43 |
| | ALT | 0.00 | 0.00 | 1.03 | 1.50 | 0.00 | 0.00 | 0.06 | 0.00 | 2.59 |
| | CHEM | 0.00 | 0.00 | 2882.80 | 0.00 | 0.21 | 0.00 | 0.00 | 0.00 | 2883.01 |
| | Total | 0.00 | 132.05 | 6051.93 | 4.95 | 1725.85 | 9.70 | 3.46 | 0.00 | 7927.94 |
| Level 3 | TRMM | 0.00 | 0.00 | 0.00 | 0.00 | 8.53 | 0.33 | 0.00 | 0.00 | 8.86 |
| | A M - 1 | 0.00 | 241.40 | 0.00 | 0.00 | 38.07 | 0.00 | 0.50 | 0.00 | 279.97 |
| | COLOR | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | AERO | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | ADEOS II | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | P M - 1 | 0.00 | 241.40 | 0.00 | 0.00 | 17.06 | 0.14 | 0.58 | 0.00 | 259.18 |
| | ALT | 0.00 | 0.00 | 0.00 | 10.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.00 |
| | CHEM | 0.00 | 0.00 | 2.27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.27 |
| | Total | 0.00 | 482.80 | 2.27 | 10.00 | 63.66 | 0.47 | 1.08 | 0.00 | 560.28 |
| Level 4 | TRMM | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | A M - 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | COLOR | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | AERO | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | ADEOS II | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | P M - 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | ALT | 0.00 | 0.00 | 0.00 | 5.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 |
| | CHEM | 0.00 | 0.00 | 0.54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.54 |
| | Total | 0.00 | 0.00 | 0.54 | 5.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.54 |
| TOTAL (Level 1-4) | TRMM | 0.00 | 0.00 | 0.00 | 0.00 | 248.72 | 1.31 | 0.00 | 0.00 | 250.03 |
| | A M - 1 | 0.00 | 395.45 | 3174.00 | 0.00 | 2517.47 | 0.00 | 1.80 | 0.00 | 6088.72 |
| | COLOR | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | AERO | 0.00 | 0.00 | 0.00 | 0.00 | 0.42 | 0.00 | 0.00 | 0.00 | 0.42 |
| | ADEOS II | 0.00 | 0.00 | 0.00 | 3.52 | 0.00 | 0.00 | 0.00 | 0.00 | 3.52 |
| | P M - 1 | 0.00 | 241.40 | 4834.34 | 0.00 | 497.44 | 10.59 | 2.68 | 0.00 | 5586.45 |
| | ALT | 0.00 | 0.00 | 24.18 | 18.00 | 0.00 | 0.00 | 0.06 | 0.00 | 42.24 |
| | CHEM | 0.00 | 0.00 | 2900.94 | 0.00 | 0.43 | 0.00 | 0.00 | 0.00 | 2901.37 |
| | TOTAL | 0.00 | 636.85 | 10933.46 | 21.52 | 3264.48 | 11.90 | 4.54 | 0.00 | 14872.75 |

Product Set Storage Requirements (At and Post Launch)



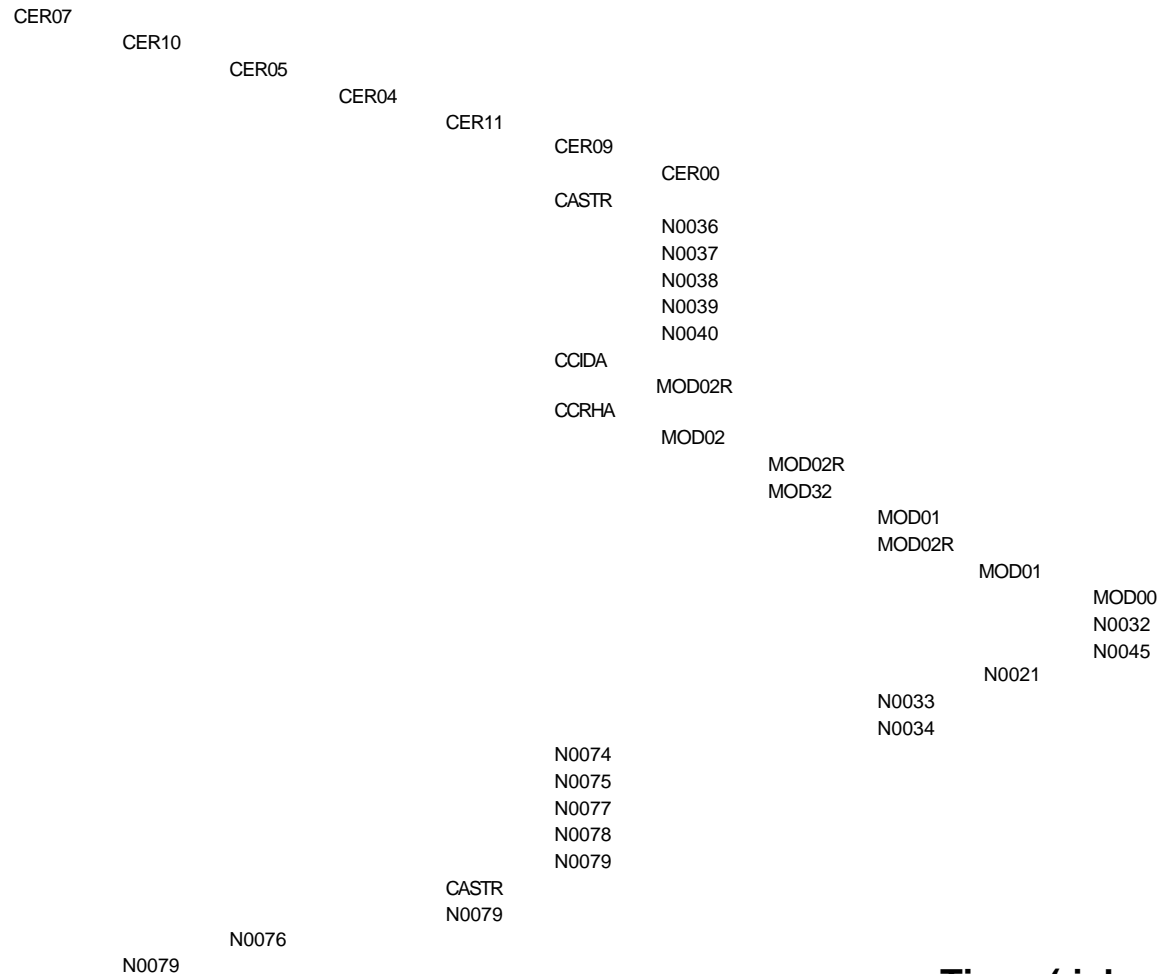
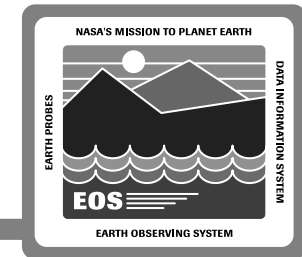
| Level | Platform | ASF | EDC | GSFC | JPL | DAACs | MSFC | NSIDC | ORNL | TOTAL (GB/DAY) |
|----------------------|----------|------|---------|---------|------|--------|------|-------|------|-------------------|
| | TRMM | 0.00 | 0.00 | 0.00 | 0.00 | 6.11 | 0.07 | 0.00 | 0.00 | 6.18 |
| | A.M - 1 | 0.00 | 89.64 | 66.96 | 0.00 | 47.33 | 0.00 | 0.00 | 0.00 | 203.93 |
| | COLOR | 0.00 | 0.00 | 0.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.61 |
| | AERO | 0.00 | 0.00 | 0.00 | 0.00 | 0.26 | 0.00 | 0.00 | 0.00 | 0.26 |
| | ADEOS II | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 |
| Level 0 | P.M - 1 | 0.00 | 0.00 | 82.38 | 0.00 | 6.22 | 0.72 | 0.00 | 0.00 | 89.32 |
| | ALT | 0.00 | 0.00 | 1.08 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 1.10 |
| | CHEM | 0.00 | 0.00 | 0.54 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 | 0.81 |
| | Total | 0.00 | 89.64 | 151.57 | 0.08 | 60.19 | 0.79 | 0.00 | 0.00 | 302.27 |
| | TRMM | 0.00 | 0.00 | 0.00 | 0.00 | 0.62 | 0.68 | 0.00 | 0.00 | 1.30 |
| | A.M - 1 | 0.00 | 296.00 | 644.20 | 0.00 | 200.93 | 0.00 | 0.00 | 0.00 | 1141.13 |
| | COLOR | 0.00 | 0.00 | 0.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 |
| | AERO | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.02 |
| | ADEOS II | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 |
| Level 1 | P.M - 1 | 0.00 | 0.00 | 675.23 | 0.00 | 1.23 | 5.10 | 0.00 | 0.00 | 681.56 |
| | ALT | 0.00 | 0.00 | 8.62 | 0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 8.76 |
| | CHEM | 0.00 | 0.00 | 1.13 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 | 1.19 |
| | Total | 0.00 | 296.00 | 1329.88 | 0.19 | 202.86 | 5.78 | 0.00 | 0.00 | 1834.71 |
| | TRMM | 0.00 | 0.00 | 0.00 | 0.00 | 9.93 | 0.02 | 0.00 | 0.00 | 9.95 |
| | A.M - 1 | 0.00 | 617.74 | 148.90 | 0.00 | 42.49 | 0.00 | 2.87 | 0.00 | 812.00 |
| | COLOR | 0.00 | 0.00 | 0.46 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.46 |
| | AERO | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | ADEOS II | 0.00 | 0.00 | 0.00 | 0.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.45 |
| Level 2 | P.M - 1 | 0.00 | 91.87 | 150.45 | 0.00 | 19.86 | 0.38 | 2.90 | 0.00 | 265.46 |
| | ALT | 0.00 | 0.00 | 0.12 | 0.01 | 0.00 | 0.00 | 0.03 | 0.00 | 0.16 |
| | CHEM | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.30 |
| | Total | 0.00 | 709.61 | 300.23 | 0.46 | 72.28 | 0.40 | 5.80 | 0.00 | 1088.78 |
| | TRMM | 0.00 | 0.00 | 0.00 | 0.00 | 0.65 | 0.17 | 0.00 | 0.00 | 0.82 |
| | A.M - 1 | 0.00 | 3.49 | 0.00 | 0.00 | 4.33 | 0.00 | 0.00 | 0.00 | 7.82 |
| | COLOR | 0.00 | 0.00 | 0.54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.54 |
| | AERO | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | ADEOS II | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Level 3 | P.M - 1 | 0.00 | 3.49 | 0.00 | 0.00 | 1.30 | 0.00 | 0.01 | 0.00 | 4.80 |
| | ALT | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | CHEM | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 |
| | Total | 0.00 | 6.98 | 0.63 | 0.00 | 6.28 | 0.17 | 0.01 | 0.00 | 14.07 |
| | TRMM | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | A.M - 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | COLOR | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | AERO | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | ADEOS II | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Level 4 | P.M - 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | ALT | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | CHEM | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| | Total | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| | TRMM | 0.00 | 0.00 | 0.00 | 0.00 | 17.31 | 0.94 | 0.00 | 0.00 | 18.25 |
| | A.M - 1 | 0.00 | 1006.87 | 860.06 | 0.00 | 295.08 | 0.00 | 2.87 | 0.00 | 2164.88 |
| | COLOR | 0.00 | 0.00 | 2.31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.31 |
| | AERO | 0.00 | 0.00 | 0.00 | 0.00 | 0.28 | 0.00 | 0.00 | 0.00 | 0.28 |
| | ADEOS II | 0.00 | 0.00 | 0.00 | 0.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.56 |
| TOTAL (Level 0-4) | P.M - 1 | 0.00 | 95.36 | 908.06 | 0.00 | 28.61 | 6.20 | 2.91 | 0.00 | 1041.14 |
| | ALT | 0.00 | 0.00 | 9.82 | 0.17 | 0.00 | 0.00 | 0.03 | 0.00 | 10.02 |
| | CHEM | 0.00 | 0.00 | 2.08 | 0.00 | 0.33 | 0.00 | 0.00 | 0.00 | 2.41 |
| | TOTAL | 0.00 | 1102.23 | 1782.33 | 0.73 | 341.61 | 7.14 | 5.81 | 0.00 | 3239.85 |

Product Dependency List (Partial)



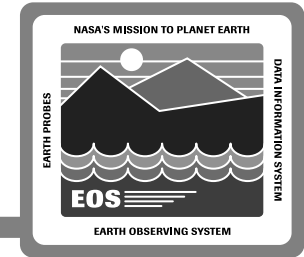
| Product | Inputs | | | | | | | | |
|---------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| CASTR | N0036 | N0037 | N0038 | N0039 | N0040 | | | | |
| CCIDA | MOD02R | | | | | | | | |
| CCRHA | MOD02 | | | | | | | | |
| CER00 | | | | | | | | | |
| CER01 | CER00 | | | | | | | | |
| CER02 | CER01 | | | | | | | | |
| CER03 | CER01 | | | | | | | | |
| CER04 | CER11 | CASTR | N0079 | | | | | | |
| CER05 | CER04 | | | | | | | | |
| CER06 | CER12 | | | | | | | | |
| CER07 | CER10 | N0079 | | | | | | | |
| CER08 | CER07 | | | | | | | | |
| CER09 | CER00 | | | | | | | | |
| CER10 | CER05 | N0076 | | | | | | | |
| CER11 | CER09 | CASTR | CCIDA | CCRHA | N0074 | N0075 | N0077 | N0078 | N0079 |
| CER12 | CER11 | | | | | | | | |

Example Dependency Tree (CER07)



<- Time (job step)

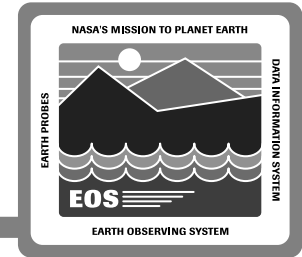
SDR Requirements Baseline



Requirements Baseline - May 1994 Functional and Performance Specification (F&PRS)

- **SDS traceability reflects DID216 without latest (minor modifications)**
- **Holistic approach to design instead of zeroing in on specific requirements**
 - **Treated requirements from system point of view - not per implied design elements**
 - **Most design elements from F&PRS do not exist in current design**
- **Requirements interpretation significantly influenced by architecture / design drivers**

Product Dependency Design Implications



Increase in staging disk required for processing

Increase in I/O bandwidth required within processing string

More CPU cycles required for additional I/O

Increased inter-DAAC traffic

Complications of scheduling to respond to potential dependency breakages

System Design Detail



Logical Architecture Model (Different design views)

- Object
- Functional
- Dynamic

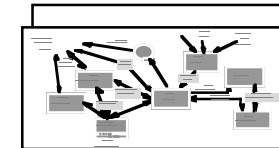
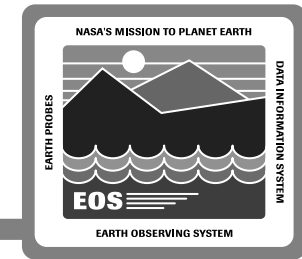
Implementation Architecture

- Software architecture decomposed down to subsystems and service classes (S/W CIs)
- Identification of representative hardware classes and COTS software classes and custom software to be developed
 - e.g., file servers, supercomputers, routers
 - e.g., DBMS, FSMS
 - Custom software LOC

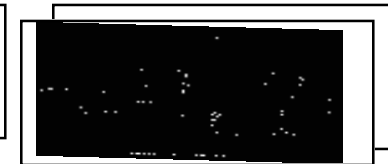
Requirements allocation/traceability provided to subsystems/services

Requirements categorized and allocated to Releases

Design Flow

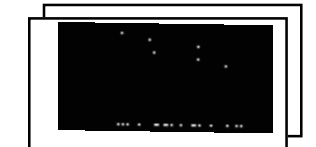


Functional Flows

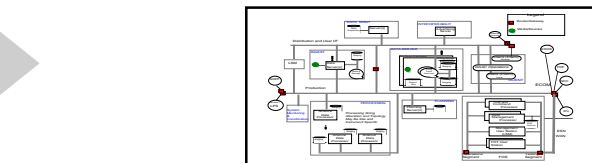


Object Models

Logical Architecture Model



Event Traces



Implementation Architecture

| Trace ID | Trace Name | Trace Type | Trace Category | Trace Release |
|----------|-----------------|-----------------|-----------------|-----------------|
| 1 | 194-703-PP1-001 | 194-703-PP1-001 | 194-703-PP1-001 | 194-703-PP1-001 |
| 2 | 194-703-PP1-002 | 194-703-PP1-002 | 194-703-PP1-002 | 194-703-PP1-002 |
| 3 | 194-703-PP1-003 | 194-703-PP1-003 | 194-703-PP1-003 | 194-703-PP1-003 |
| 4 | 194-703-PP1-004 | 194-703-PP1-004 | 194-703-PP1-004 | 194-703-PP1-004 |
| 5 | 194-703-PP1-005 | 194-703-PP1-005 | 194-703-PP1-005 | 194-703-PP1-005 |
| 6 | 194-703-PP1-006 | 194-703-PP1-006 | 194-703-PP1-006 | 194-703-PP1-006 |
| 7 | 194-703-PP1-007 | 194-703-PP1-007 | 194-703-PP1-007 | 194-703-PP1-007 |
| 8 | 194-703-PP1-008 | 194-703-PP1-008 | 194-703-PP1-008 | 194-703-PP1-008 |
| 9 | 194-703-PP1-009 | 194-703-PP1-009 | 194-703-PP1-009 | 194-703-PP1-009 |
| 10 | 194-703-PP1-010 | 194-703-PP1-010 | 194-703-PP1-010 | 194-703-PP1-010 |
| 11 | 194-703-PP1-011 | 194-703-PP1-011 | 194-703-PP1-011 | 194-703-PP1-011 |
| 12 | 194-703-PP1-012 | 194-703-PP1-012 | 194-703-PP1-012 | 194-703-PP1-012 |
| 13 | 194-703-PP1-013 | 194-703-PP1-013 | 194-703-PP1-013 | 194-703-PP1-013 |
| 14 | 194-703-PP1-014 | 194-703-PP1-014 | 194-703-PP1-014 | 194-703-PP1-014 |
| 15 | 194-703-PP1-015 | 194-703-PP1-015 | 194-703-PP1-015 | 194-703-PP1-015 |
| 16 | 194-703-PP1-016 | 194-703-PP1-016 | 194-703-PP1-016 | 194-703-PP1-016 |
| 17 | 194-703-PP1-017 | 194-703-PP1-017 | 194-703-PP1-017 | 194-703-PP1-017 |
| 18 | 194-703-PP1-018 | 194-703-PP1-018 | 194-703-PP1-018 | 194-703-PP1-018 |
| 19 | 194-703-PP1-019 | 194-703-PP1-019 | 194-703-PP1-019 | 194-703-PP1-019 |
| 20 | 194-703-PP1-020 | 194-703-PP1-020 | 194-703-PP1-020 | 194-703-PP1-020 |

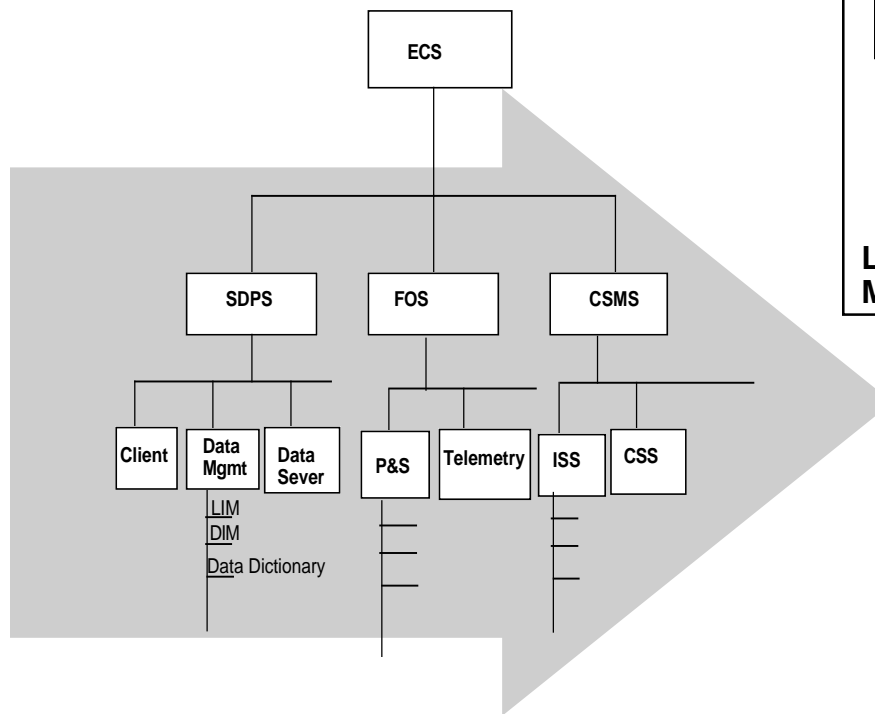
Traceability Matrix

- to Design (SDS)
- to Category/Release in Verification Spec

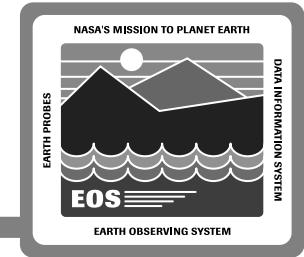
Functional
& Performance
Specification

Drivers

Projected System
Access and
Utilization



Categorization of Requirements



Mission Critical

- **No data loss, ensure system does not lose any lower level data needed to generate downstream data (e.g. higher level products)**

Mission Essential

- **Basic services for the long term data storage,**
- **Data management necessary to provide services to the user community that serves the majority of earth science researcher service needs in basic data distribution**

Mission Fulfillment

- **Advanced services specifically targeted at increasing the earth science user's productivity**
- **Advanced services specifically targeted at meeting larger programmatic goals**
- **Advanced services providing intermediary support of educational, policy, social services community**
- **Advanced services for access to GCDIS and UserDIS**

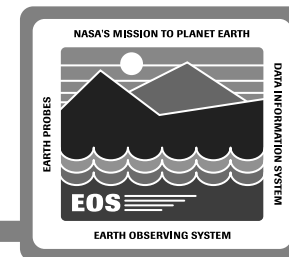
Projected System Access and Utilization



Information was analyzed to determine bounds of uncertainty in the numbers and to give a point from which to analyze the system for flexibility to accommodate the uncertainty

- Flexibility of design presented at this review
 - Distribute 4 to 8.5 TB per day
 - Scale to changes in product set (8 times in processing, 2 times in storage)
- Cost sensitivity presented as part of Cost Briefing

Agenda



SDR Baseline

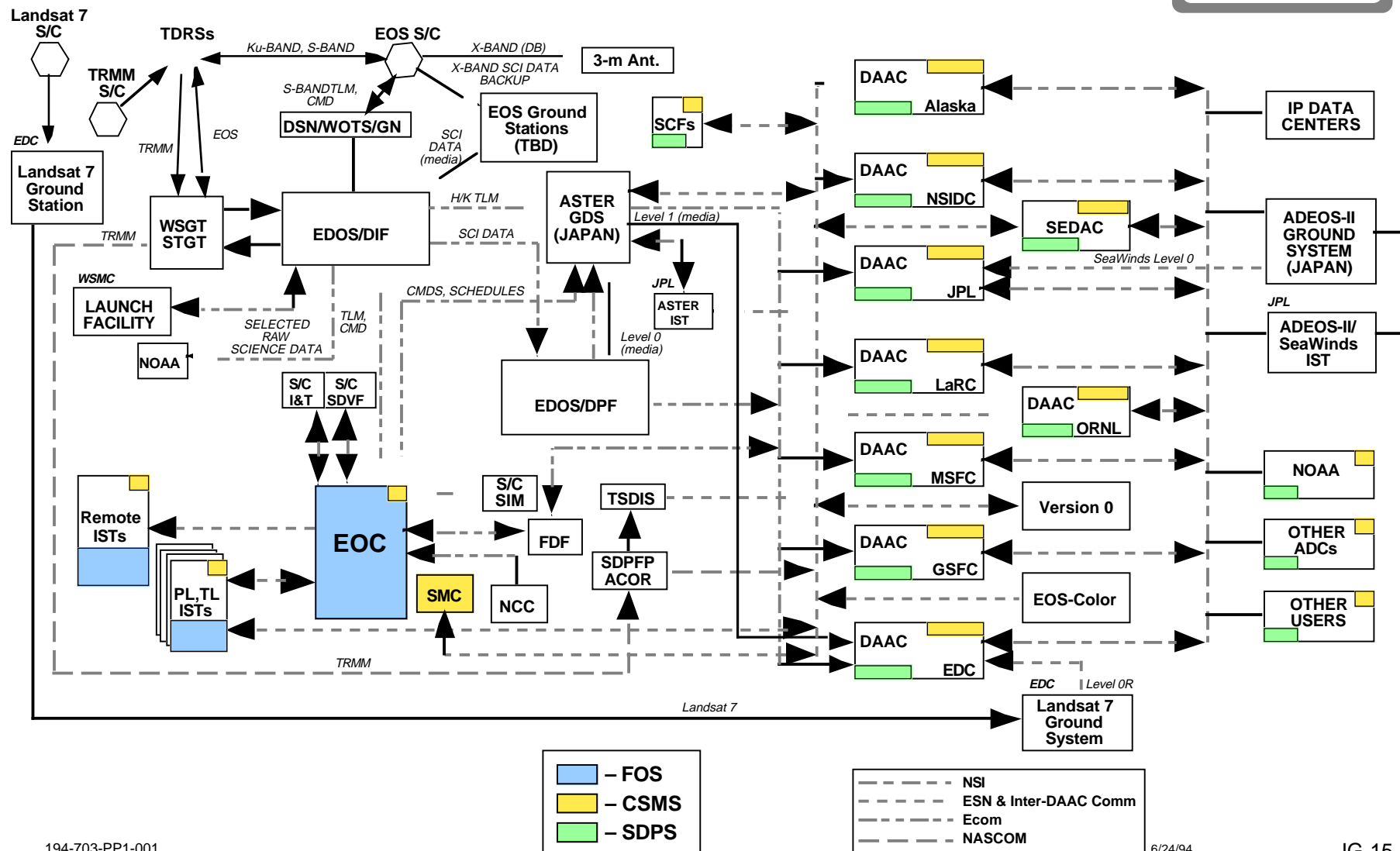
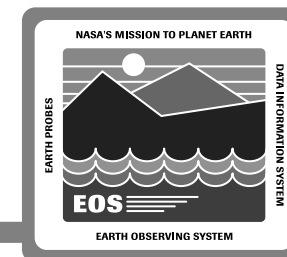
- Missions Supported
- Product Set
 - Processing
 - Storage
 - Product Dependencies
- Requirements

SDR Design Detail

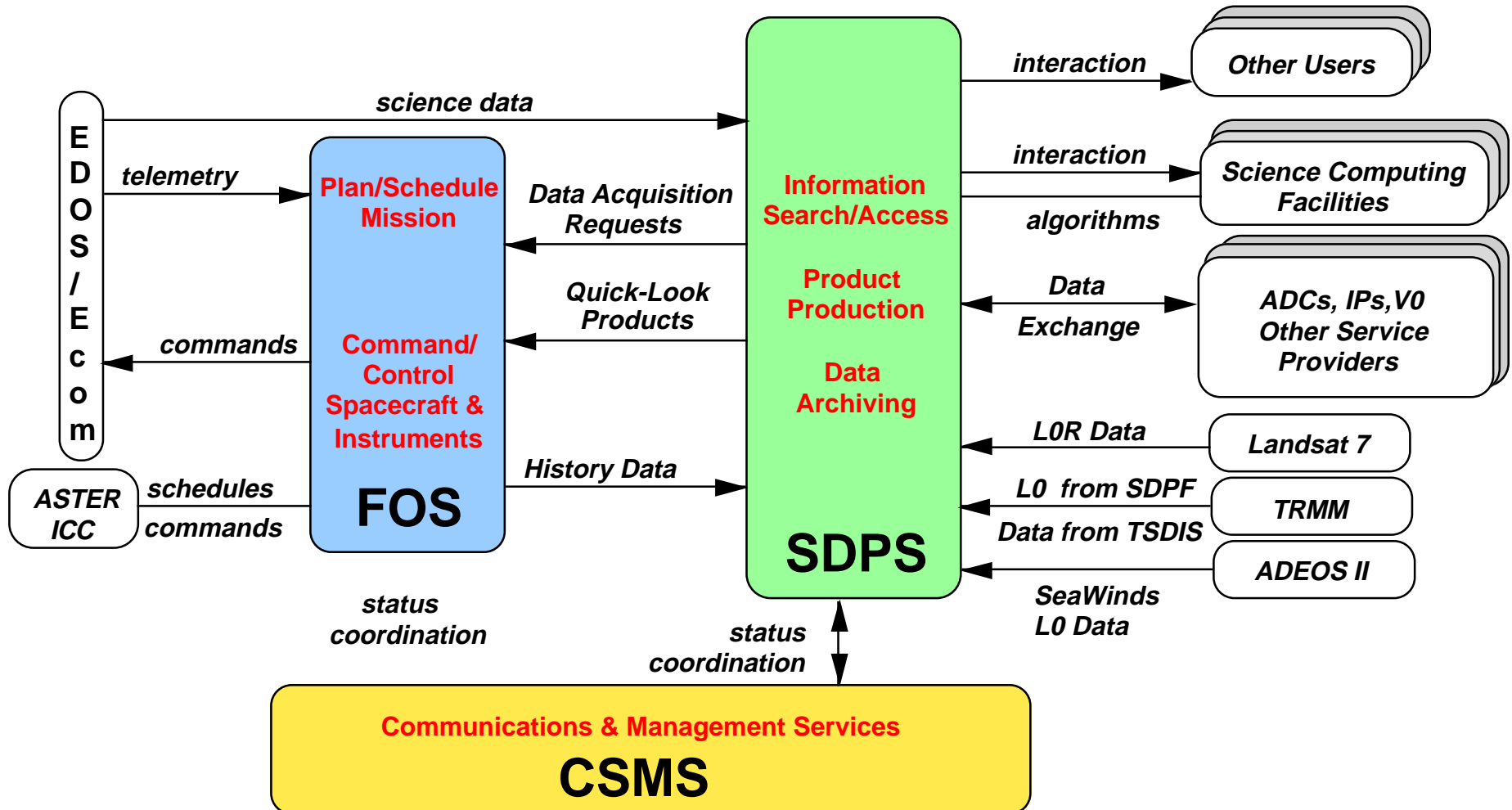
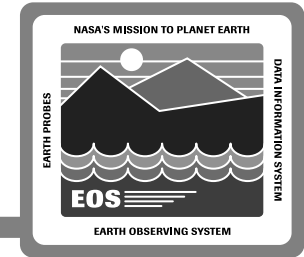


System Overview

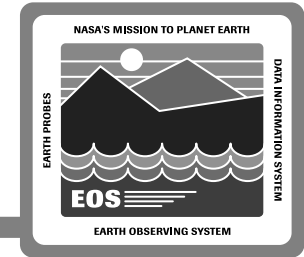
EOSDIS Context



ECS Context



Segment Roles



Science Data Processing Segment (SDPS) is responsible for reliably producing, maintaining, archiving and providing access to global science research data

Flight Operations Segment (FOS) provides mission operations, ensuring the health and safety of the space assets

Communications and Systems Management Segment (CSMS) is the Infrastructure that interconnects and manages ECS resources

ECS Reference Model

